

RESEARCH METHODOLOGY IN MONTANISTIC TOURISM WITH RESPECT TO THE CZECH REPUBLIC

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Abstract

Research methodology in montanistic tourism involves the archival research and study of special literature, surface and underground field survey, the analysis of findings of rock fragments, mineral composition, traces of metallurgical processes, fragments of pottery, etc. A separate problem is the study and evaluation of the development of mining and post-mining landscapes, focusing on the entire supply chain of resource industries and their impact on the cultural development of the country.

Keywords: Research of montanistic objects, archival and literary research, surface exploration, underground exploration, research of mining and post-mining landscape.

1 INTRODUCTION

The Czech Republic is a territory where mining activities have been developed from antiquity to the present. Therefore, it is essential to deal with the development of montanistic tourism. This tourism as a specific type of industrial tourism is characterized by its own research methodology, which includes archival, literary, field, and laboratory methods adapted to study mining, processing, metallurgical and transportation historical and contemporary objects, and analyzing mining and post-mining landscapes (Fig.1). The presented article focuses just on these questions.

Prospecting and exploring historical and contemporary traces of mining activities has been in the spotlight of stakeholder experts and institutions for a long time. Archaeological findings about the development of technological processes from prospecting to mining and the production of precious and utilitarian metals illustrate development trends of human society from ancient until recent times. Examples of specific manufacturing and settlement areas related to the ore as well as coal mining of the modern age attract the attention not only of specialists but also the general public. All immovable remnants of mining activities are considered as archaeological findings, because they are the result of human activity and may include movable findings.

In many regions, evidences of developed prehistoric mining and mineral processing have been found. With the development of field archeology techniques and auxiliary geophysical and geodetic methods, both the number of sites and the number of types of objects greatly expanded.

Forms of the research of medieval montane landscapes include the study of archival and literary sources, archaeological field research, mining survey of old workings, evaluation and laboratory analysis of field collection and the study of mining and post-mining landscape [13].

Until recently, technical monuments were in our country rather neglected. Archaeologists paid small attention to remains of prehistoric and medieval mining and processing of raw materials. By the preservation of monuments, some circular brickyards and lime works, water and windmills, granaries, fountains, bridges, canals, and some water works were protected. Caring for manufacturing and industrial buildings promoted only slowly. In 1973, for example, the National Technical Museum in Prague together with the National Institute of Monument Care and Nature Protection initialized the inventory of monuments in the Kladno coalfield and Ostrava-Karvina coalfield. The attention to technical monuments remained marginal until 1989. A certain change happened in 1996, when the grant project of the Ministry of Culture entitled "Research and technological industrial areas and buildings" was launched whose bearer became the National Heritage Institute in Prague. In 2002, it founded the Research Centre for Industrial Heritage at the Czech Technical University in Prague. The geological (mining) history research of montanistic activities thus began legitimately to develop enough [13].

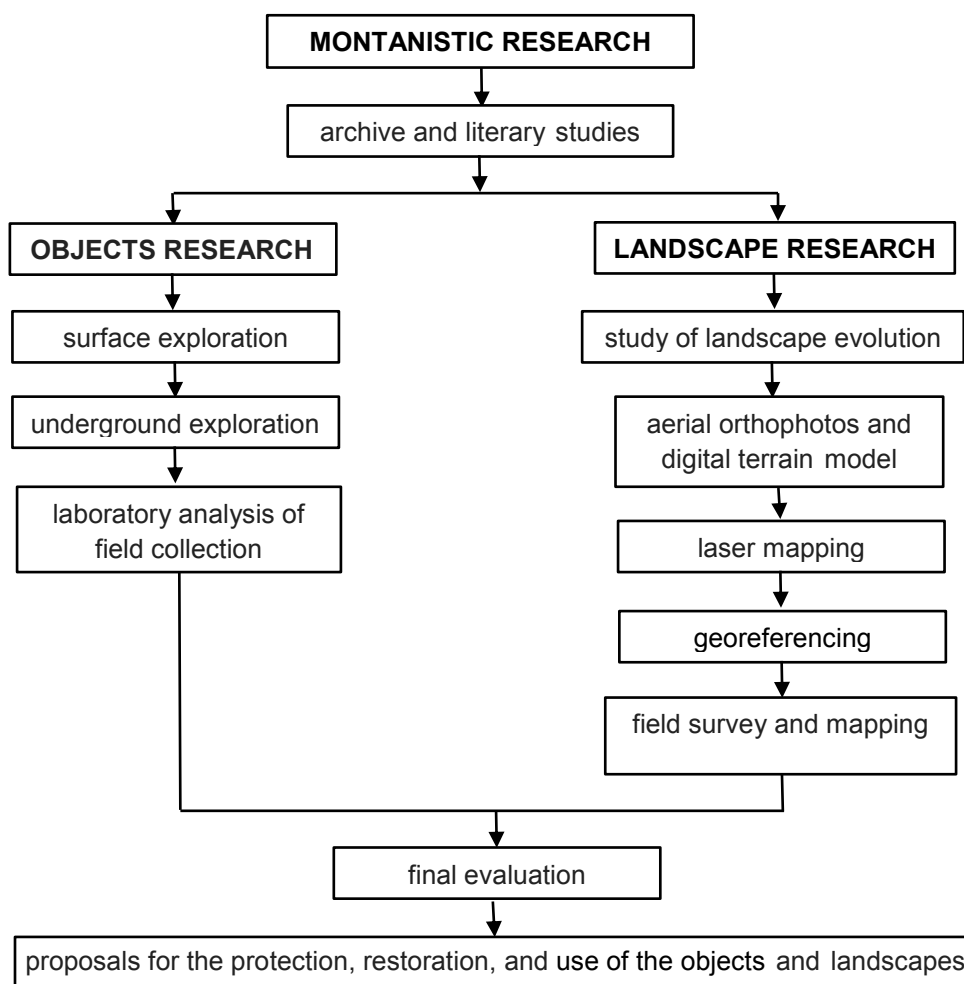


Fig. 1: Diagram of research of mining objects and landscapes

2 STUDY OF ARCHIVAL AND LITERARY MATERIALS

The study of archival materials, i.e. written and mapping historical sources, records of exploration and mining organizations, research reports, expert opinions, etc. means a necessary initial step that allows to recognize the importance and utilization of mineral resources and forms of mining of activities in the past [17-18]. From the archival images, i.e. maps, drawings, and photographs can also detect changes in observed landscapes and the gradual adjustment of mining complexes, settlements, and transportation routes. The identification of prehistoric activities on the relics of historic mines is difficult because they were mostly destroyed by the activities of modern times (agriculture, mining, construction work, etc.).

Archives are among the oldest and most known so-called memory institutions. Already the oldest civilizations have payed special attention to storing important documents and created archives of various extents. The first church and municipal archives are already known from the period of the Sumerian city-states and empires that succeeded them in the territory of Mesopotamia. Over the centuries a wide network of archives of various kinds and degrees had been created, which stored large quantities of various documents of significant scientific, cultural as well as economic, legal, and administrative standpoints. The oldest Czech state archive was the ancestral archive of the ruling princes of Premyslids. The most important file in the National Archives is the Archive of the Czech Crown, which was declared a National Historic Landmark. The mining funds, containing writings about mining and minting in Bohemia, Moravia, and Silesia from the registers of the Czech Office, the Czech Chamber of Commerce and the old Czech Governorship from the 18th century, are of an extraordinary importance. The current institutional arrangement of archives in the Czech Republic has its roots in the 50s of last century. Besides the National Archives, it includes regional archives.

The study of archive materials clearly demonstrated that they can be a source of important information about the montanistic activities in historical times. The accounting, tax, and guild records, commemorative books, maps of mining, etc., which represent a hidden amount of knowledge, were conducted in the mining district [6].

Important sources of knowledge may be specialized literary works, starting from the Agricola publication “De re metallica libri duodecima” in 1556 to the Czech provenance fundamental work of Count Caspar Sternberg “Umrisse einer der Geschichte böhmischen Bergwerk” from 1836 to 1838. In recent decades, many authors have compiled the history of mining and geological characteristics of mineral deposits in regions of the Czech lands to acquire knowledge affected by generations and thus make it available to all those interested in this issue. Since the nineties, nearly two dozen of very well-researched books have been issued.

Useful information can often be found in the literature of related fields. A typical example is Topographic mineralogy of Bohemia [10] which contains a plurality of data on mining activities. It also includes synthetic works on the history of mining and metallurgy [7, 8, 9, 12]. All these works reflect a solid, albeit underused basis for montanistic archaeological prospecting.

Archiving is one of the components involved in the performance of state and local governments, and as such is subject to specific legal regulations. Therefore, definitions of basic concepts such as archives and archival documents found in the archive law, which sets the rules of selection, registration, and categorization of archival documents, principles for their protection, rights and obligations of originators, owners, holders and administrators, determine the organizational archival system of our archival science and adjust options for the use of archive materials for scientific and private purposes [17]. The researcher shall follow the research rules of each archive.

General regulations govern but only part of the document creation [2]. In the mining area, in accordance with § 185 of the General Mining Act of 23 May 1854, miners had to keep mandatory mine maps if the length of the mine corridors exceeded 200 meters, and the Bureau of Mines could consult them and trace them to complement their records. Act No. 169/1927 Coll. modified the wording of this paragraph in the sense that a top entrepreneur, at his own expense, had to obtain and transmit the image of operating mine maps to the first instance Mining Office and complement the map every six months by current status. The professional public has demanded improvements in the care of the important economic documents for legal reasons and commercial promotion. Major companies began to gradually improve the care of their documentation and acceded to building archives as their facilities. The archives in 1945 passed into other hands. The Ministry of Industry and the newly created central authority for national mining company Czechoslovakian mines in Prague devoted great effort to their rescue and utilization for practical and scientific purposes. In 1949, it was agreed to set up two central mining archives, in Kutná Hora for the Czech lands and in Banská Štiavnica for Slovakia. Government Resolution of 1952 established the Geological fund of the Central Geological Institute in Prague as an archive, which were to focus on the overview and results of geological works carried out in the country and all the scientific literature. Later this task was taken over by the Geofund, Prague.

Archival investigation and research are designed to maximize the information on the locality (or on the wider environment) already existed in the past that was obtained at various levels and thus make the new survey as economical as possible. Typically in this phase the following survey occurs:

- Use of results of basic and applied research studies, readily accessible professional literature dealing or dealt with the territories in question or a specific problem. As standard, this includes publications dealing with the regional-geological division of the territory or its geomorphology.
- Study of existing maps (cadastral, geological, geomorphological, geological, hydrogeological, maps of mineral resources, etc.), including detailed explanatory notes on these maps.
- Use of the data stored in the archives of the Czech Geological Survey - Geofund.
- Use of the data stored in the archives of current or former exploration companies and organizations. Those treat the stored data commercially, usually in the form of sales of archival research on the subject locality.

3 SURFACE MINING ARCHEOLOGICAL RESEARCH

In the areas of the historic mining and processing of raw materials, the surface exploration focuses on the location, intensity and chronology of mining activities. The survey is usually first realized as nondestructive. Using the terrain prospecting and the analysis of air documents (orthophoto images, lidar images) mining areas are searched and key locations are found. The surfaces are subsequently investigated by excavation in places where chronologically or technologically meaningful situations can be expected. Combining with other disciplines (e.g. deposit geology, geomorphology, metallurgy, geophysical prospecting), a number of details of the mined material, or the place and method of processing of the excavated material can be determined. Surface mining and water works, outcrops of subsurface works, relics of transport facilities and roads, large spoil heaps etc. can be reliably documented archaeologically. Main types of mining relics correspond, by their shape and placement, to the character of primarily deposits and intensity of mining. Ore-bearing rocks concentrated into veins create significant objects typically in a linear arrangement; mineralization localized in a larger space

manifests itself with small objects scattered over larger areas. In addition there are significant depressions and dumps, usually located near the entrance of a gallery or shaft. Inconspicuous relics of miners' dwellings, field communications, or nowadays usually dry water ditches, bringing water for pumping equipment or ore crusher, are also important.

It is difficult to determine the temporal position of detected object. The relative chronology can be estimated by the superposition of relics [4]. Found relics dating can be based on samples of wood (dendrochronology), cinders (radiocarbon method), types of metal and ceramic objects, etc.

The most productive method of research is the surface exploration because it allows, without any significant need, to find out information about the conditions of mining, its technology, extent, productivity and dating, or even a broader spatial context [13].

4 UNDERGROUND MINING ARCHAEOLOGICAL RESEARCH

A survey of underground mining works is accompanied by considerable technical obstacles as well as is also extremely demanding methodically since the informative value of the mine workings fluctuates strongly. The works are usually open only partly; their spaces are dirty, covered with weathering products or partially completely devastated. Also their reinforcement constitutes a problem as it makes the access to rock mass difficult or completely impossible. From an archaeological point of view, it is important to document underground the shape of the hollow space as well as record the position of movable finds in their original positions. The survey and detailed documentation of the mine spaces can be completed by a dendrochronological analysis of the elements of mining equipment, environmental studies, or even by archaeological soundings of sediments. The evaluation of findings can enrich the knowledge on the development extraction of deposits and used mining technology [1].

Important information may be provided by geophysical methods that can identify existing subsurface structural and mining works. Besides geoelectrical profiling and shallow impact seismics, very good data is provided by ground penetrating radar (georadar).

The biggest problem consists in the fact that underground spaces have not yet been perceived as archaeological monuments [4]. In the survey the mining experts, geologists and enthusiastic laymen were interested, who generally did not respect the procedures used during archaeological researches but mostly watched professional mining and mineral deposit terms.

5 RESEARCH OF ROCK MATERIALS, DEPOSIT FILLING, METALLURGICAL RELICTS AND ARCHAEOLOGICAL FINDS

The research of rock material and fragments of deposit fillings, which are obtained during the survey of heaps, subsidences (pinges), and mine workings, is an important part of the montanistic objects evaluation, because it leads to more accurate understanding of both the geology and the nature of mining works, and to the spatial analysis of identification field.

Attention is also focused on the study of movable metallurgical remains, such as slag, ingots of metal ore residues, technical ceramics, cinders, and others. These discoveries are often the only reliable guide for the accurate determination of the technological process, processed materials, and function of individual objects, and potentially for their dating.

The evaluation of slags, whose formation and properties were the result of the metallurgical process, is a source of important information. An essential part of their study consists in the description of typology of morphological features and the analysis of their composition. It is also important to estimate waste cubage, which can be a basis for estimating the volume of production.

For scheduling objects useful information is provided by studies of archaeological finds, such as finds of pottery, building structures and their materials, arrangement of mining buildings and settlements, etc.

6 STUDY OF MINING AND POST-MINING LANDSCAPE

The processes of prospection, exploration, mining and processing of utilizable mineral resources accumulations, more or less, dramatically transformed the landscape where they occurred and are occurring. The surface of mining landscape reflects its historical development during mining colonization and industrialization. The landscape structure is the result of periods of rise and decline of mining and processing activities, and their replacement or supplementing by other economic activities.

Archival materials and historical topographical, cadastral, and mining maps that provide reliable information on mining are used in studying mining landscape. Their usages, however, are limited by the fact that not all the montanistic objects (especially in ancient times) were drawn into maps. Moreover, in many cases, it was especially old mine workings drawn to local topographic networks, which are difficult to incorporate into the currently used systems. In many cases, it is complicated to interpret these materials. Unfortunately, it is also the fact that some archival materials have been destroyed.

The basic method of studying mining landscape is a field survey and mapping. The aim is to trace the relics of montane objects (solitary dumps or their strokes, depressions, quarries) and objects associated with them, such as traffic routes, water works, treatment plants, metallurgical equipment and settlements. The assessment is based on the morphology of the findings. This allows determining the type and function of the object, and possibly included time [11].

Very good usable documents are provided by remote sensing. Air stereophotogrammetry describes detailed topography (orthophotos) and elevation (digital terrain model), from which we can read the extent of historical mining of various ores, how rich is the range of manifestations of mining on the landscape surface and how many of them are still preserved in the unexplored places.

Laser scanning allows creating three-dimensional models of the terrain cleared of vegetation cover even in hard to reach areas. The resulting image is the basis for the search for previously unknown objects and their preliminary interpretation and documentation. This allows historians, geologists, and montanistic archaeologists to see how rich the spectrum of mining manifestations on the landscape surface is and how many of them have been preserved as yet unexplored areas [3]. They can understand the important connections between individual elements of the mining landscape and gain scientific material that can subsequently be used in addressing the protection of monuments and the tourist use of specific objects or entire territory, as is the case in the Krušné hory (Erzgebirge) mining landscape. Aerial laser scanning is, of course, one way of exploring mining landscape only. Comprehensive survey, including not only the areas of mining, but the entire mining landscape, is essential.

An important component of the research is georeferencing, i.e. the establishment of objects to the coordinate system. The resulting process can be advantageously used tools like geographic information systems [16].

7 INTERPRETATION OF RESEARCH WORK

The interpretation of the results of research work focuses on the study of technological, economic-social, residential, transportation, landscape, and cultural aspects of the utilization of mineral resources in the mining landscape, both in the pre-modern and contemporary periods. The continuous monitoring of all montanistic sites categories is in fact an essential source of information, but that was subject and is subject to gradual devastation. Therefore, it is necessary to focus our attention on a systematic and comprehensive study of all tangible artifacts that are collected during fieldwork.

The logical resulting step must be proposals for the type of protection, remediation, and possible use of acquired knowledge in the activities of montanistic tourism.

8 CONCLUSION

The identification, recognition of values, and documentation of mining works is a complex and interdisciplinary task. Modern techniques work so as to minimize damage of the surveyed objects. This approach is also required in the case of montanistic heritage. It is important to preserve and conserve both the investigated objects and historic post-mining landscape which constitutes a unifying landscape element [14].

An inalienable component of the research must be, in case of underground mining works, respecting the laws of the State Mining Administration, concerning the safety of the work performed and persons conducting the research.

Given the large increase of data obtained by applying spatial mapping and other methods of remote sensing and surface data collection methods in the processing of results, techniques of quantitative and qualitative evaluation are used [5], [15].

In the Czech Republic, in the care of state and local governments, and interested private organizations and donors, activities aimed at protection, accessibility and utilization of montane sites greatly expanded. In the preservation of old mining and metallurgical facilities, a significant role is played by mining associations, which began, on a large scale, rise in recent decades, are of great importance.

It should be emphasized that the Czech Republic can boast outstanding examples of protection and access to mining objects and especially the regeneration of mining activities in the North Bohemian brown coal basins, in the Czech part of the Upper Silesian basin and in the regions of the former uranium mining. As a result of several thousand years of exploitation of mineral resources, the number of mining artifacts in the Czech Republic is very high. We should, therefore, to give this group of specific cultural heritage much attention.

REFERENCES

- [1] ANCEL B., BOHLY B., FLUCK P., GOERGLE B., MARTIN, D., PROBST G. *Bergbauarchäologie. - in: Leben im Mittelalter. 30 Jahre Mittelalterarchäologie im Elsa, Speyer.* 1992, 417-488.
- [2] BERAN P. *60 let archivu společnosti Sokolovská uhelná, právní nástupce, a. s., Sokolov* [online]. Available from [www.suas.cz/uploads/Historie_archivu.doc]
- [3] FONTE J., PIRES H., GONÇALVES-SECO L., RODRÍGUEZ R. M., LIMA A. Archaeological research of ancient mining landscapes in Galicia (Spain) using Airborne Laser Scanning data. [online]. 2014
- [4] DERNER K, 2014. Jsou montánní reliktů archeologické památky? In *Sborník příspěvků odborného workshopu k problematice zachování, obnově a zpřístupňování důlních děl a hornické krajiny*. Most: NPÚ, ÚOP v Lokti, 29-42.
- [5] DWYER L., GILL A., Seetaram N. *Handbook of research methods in tourism: quantitative and qualitative approaches*. Northampton, MA: Edward Elgar, 2012.
- [6] JANGL Ladislav. *České hornické právo a báňská historie: metodika báňsko-historického výzkumu*. Praha: Národní technické muzeum, 2009. Práce z dějin techniky a přírodních věd.
- [7] KOŘAN J. *Staré české železářství*. Praha: Práce, 1946.
- [8] KOŘAN J. *Sláva a pád starého českého rudného hornictví*. Příbram: Komitét sympozia Hornická Příbram ve vědě a technice, 1988.
- [9] KOŘAN J. *Přehledné dějiny československého hornictví I*. Praha: Nakladatelství Československé akademie věd, 1955.
- [10] KRATOCHVÍL J. *Topografická mineralogie Čech*. Praha: Nakladatelství ČSAV, 1957.
- [11] KRIŠTUF P., ZÍKOVÁ T., ČULÍKOVÁ L., FATKOVÁ G., GIBAS P., MALINA O., PAUKNEROVÁ K., ŠVEJCAR O., URBAN, T. *Výzkum krajiny: vybrané antropologické a archeologické metody*. Vyd. 1. Plzeň: Západočeská univerzita v Plzni, 2015.
- [12] MAJER J.: *Po kovových stezkách dějin Československa*. Příbram, 1991
- [13] NOVÁČEK K. Nerostné suroviny středověkých Čech jako archeologický problém: balance a perspektivy výzkumu se zaměřením na výrobu a zpracování kovů. *Archeologické Rozhledy*. 2001, **53**(2), 279-309.
- [14] OTGAAR A. H. J., BERG L., FENG X. R. *Industrial Tourism: Opportunities for City and Enterprise*. Routledge. 2016.
- [15] SCHEJBAL C. *Data, teorie a modely v logistice cestovního ruchu*. Přerov: Vysoká škola logistiky, 2011, 140 p.
- [16] SVATOŇOVÁ H., PLŠEK, V. Postindustrial landscape and its delineation by GIS methods. In *XXII sjezd České geografické společnosti Ostrava.: 31. srpna – 3. září 2010*. Ostrava, 2010, 137 – 141.
- [17] ŠIMEK J. Základy archivního výzkumu. *AntropoWebzin*. 2008, 2-3, 113-124.
- [18] VALÁŠEK, H.: K otázce archivnictví 21. století – více informatiky a méně historie? In *Zpravodaj pobočky České informační společnosti*, **49**. 2005, 97–102.